Worksheet 2 Searching algorithms **Answers**

Task 1

Use the 10 name cards for the activities in Task 1.

1. With the 10 name cards in a sequenced row, face down, use the binary search algorithm to search for the name **Emily**

   Leave the cards you have examined face up.

   Which card did you turn up first? Isla

   Which card did you turn up second? Ava

   Which card did you turn up third? Emily

2. Turn the cards face down again.

   Now search for the name **Sophie**

   Which cards did you turn up? Write them in order. Isla, Olivia, Poppy, Sophie

   What is the maximum number of cards you will need to find any given name? 4

   What is the maximum number of items you will have to examine if the list contains

   - 8 items? 4
   - 16 items? 5
   - 32 items? 6
   - 37 items? 6
   - 64 items? 7
   - 2^n items? n+1

3. What is the time complexity of the binary search algorithm? Explain your answer.

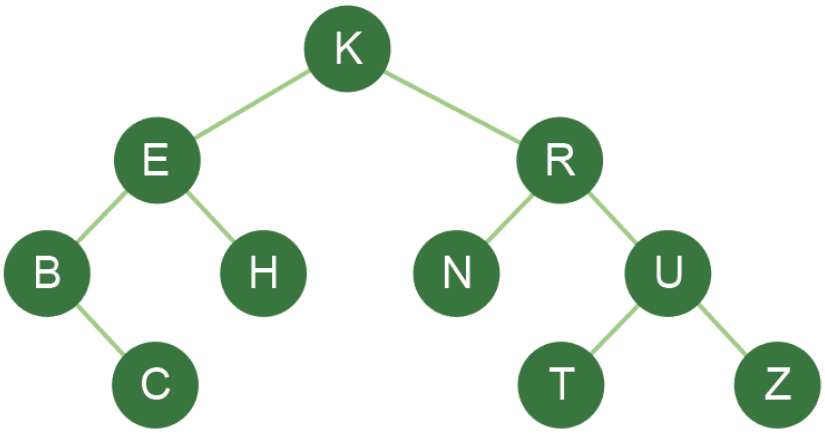
   O(log n). As the size of the list doubles, only one extra item needs to be examined, since the size of the list is halved each time. number of items examined $= \log_2 n$

4. An incomplete algorithm for the binary search is given below. Complete the missing statements 1-5.

```
function binarySearch(aList, itemSought)
   found = False
   index = -1
   first = 0
   last = len(aList)-1
   while first <= last and found == False      (1)
      midpoint = (first + last) div 2
      if aList[midpoint] == itemSought then
         found = True                          (2)
         index = midpoint                      (3)
      else
         if aList[midpoint] < itemSought then
            first = midpoint + 1               (4)
         else
            last = midpoint – 1                (5)
         endif
      endif
   endwhile
   return index
endfunction
```

Task 2

5. (a) Complete the table corresponding to the following binary search tree, assuming that the data was entered in the order: K, E, H, R, U, N, T, B, C, Z:



	Left	Data	Right
0	1	K	3
1	7	E	2
2	-1	H	-1
3	5	R	4
4	6	U	9
5	-1	N	-1
6	-1	T	-1
7	-1	B	8
8	-1	C	-1
9	-1	Z	-1

(b) Which items are visited when searching for:

(i) C? K E B C

(ii) N? K R N